

Quick Guide Disinfectant Residual



PROVIDED TO PUBLIC WATER SYSTEMS FROM THE COMPLIANCE ASSURANCE SECTION
OF THE WATER QUALITY CONTROL DIVISION

Purpose

Disinfection of drinking water is one of the major public health advances in the 20th century. One hundred years ago, typhoid and cholera epidemics were common throughout American cities. Disinfection was a major factor in reducing these epidemics.

Once drinking water is disinfected to meet public health standards, the residual disinfectant level in the distribution system must be maintained as a final barrier in protecting against disease outbreak. Maintaining this residual disinfectant prevents bacterial regrowth and protects against the intrusion of microbial contamination (viruses, bacteria, parasites, etc.), especially in the unfortunate event of a pipe break or backflow event.

Even under normal conditions, disinfectants degrade based on demand and water age. Operators must manage disinfectant levels on a frequent and ongoing basis to protect consumers.

Common Reasons for Noncompliance

- Failing to measure a distribution system disinfectant residual with each total coliform sample (including repeats)
- Sampler forgets to write the residual down on the total coliform lab slip
- Failing to maintain a minimum 0.2 mg/L residual in the distribution system
- Entry point monitoring equipment failure (SW/ GWUDI)



Chlorine injection system. Photo by Paul Kim.



Gas chlorine cylinders. Photo by Serenity Valdez.

Overview of the Disinfection Residual Requirements for Colorado Public Water Systems

Colorado Primary Drinking Water Regulations

- **Applicability:** All public water systems must use chemical disinfection unless the system has received a disinfection waiver from the Department.
- All systems must maintain a minimum 0.2 mg/L disinfectant residual in the distribution system. This must be measured at the same time and place as total coliforms samples.
- Systems that filter surface water (SW) or ground water under the direct influence of surface water (GWUDI) have special disinfectant requirements because surface water can contain viruses, *Giardia lamblia*, *Cryptosporidium* and other disease-causing organisms. The risk for disease outbreaks increases when treatment is not adequate. Therefore these systems must maintain a minimum system specific disinfectant residual at each entry point to the distribution system. (See reverse for more details.)

EPA Guidance Documents

- *Microbial and Disinfection Byproduct Rules Simultaneous Compliance Guidance Manual* (EPA 815-R-99-015) August 1999
- *Alternative Disinfectants and Oxidants Guidance Manual* (EPA 815-R-99-014) April 1999
- *STEP Guide - Complying with the Stage 1 Disinfectants and Disinfection Byproducts Rule: Basic Guide* (EPA 816-B-05-004) March 2006

Questions?

<https://www.colorado.gov/cdphe/dwcontact>

TIPS

Sampling and Compliance Tips

DISTRIBUTION SYSTEMS

Measure the distribution system residual disinfectant at the same time and place as total coliform bacteria samples (including any repeat total coliform samples).

Use a field test kit that is designed to comply with approved analytical methods for distribution system monitoring.

Make sure the sampler knows how to follow the method and how to maintain the accuracy of the field test kit. Check with the manufacturer if you are not sure how to do this.

For distribution system compliance reporting purposes, systems using chlorine should report **free chlorine** as the residual. Systems using chloramines should report **total or combined chlorine** as the residual.

For operational purposes, operators should regularly monitor chlorine demand in the distribution system by measuring total versus free chlorine residual. Microbiological contamination, as well as accumulation of sediments in a pipe, corrosion conditions, biofilm growth, and pipe materials all can cause chlorine demand.

To protect public health, systems are allowed to temporarily increase disinfectant residual, beyond the maximum residual disinfectant level (MRDL), to address a specific microbiological contamination problem.

The Department expects wholesalers to cooperate with consecutive water systems to ensure their compliance, but each water system is ultimately responsible for its own compliance.

ENTRY POINTS

Entry-point residual disinfectant (EPRD) should be taken after contact time but before the distribution system.

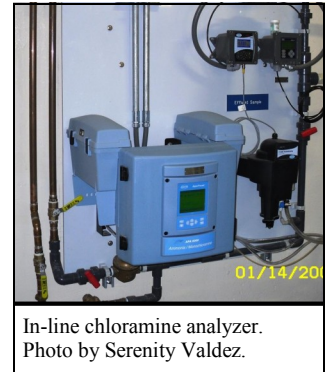
If a SW/GWUDI system's entry point is at a storage tank, the system must monitor its EPRD at the minimum frequency assigned by the Department even if the plant is not producing water at the time.

Distribution System Standards (All System Types)

- Maintain a minimum 0.2 mg/L residual disinfectant in all locations in the distribution system.
- If a public water system fails to maintain 0.2 mg/L this may result in a treatment technique violation. Treatment technique violations will require Tier 2 public notification.
- Do not exceed 4.0 mg/L on a running annual average. Exceeding this level is considered a violation for community and non-transient water systems and will require public notification.

Entry Point Standards for Surface Water (or GWUDI) Systems

- Maintain the minimum system specific disinfectant residual at each entry point to the distribution system according to the monitoring schedule.
- If the entry point disinfectant falls below the minimum system specific residual, the Department must be notified as soon as possible, but no later than the end of the next business day. If taking grab samples, you must begin taking samples every four hours until the disinfectant meets the system specific level.
- When you call, make sure you know (1) when the disinfectant level dropped below the system specific level, (2) how long it was below, and (3) what was the lowest disinfectant level. Note, according to rounding rules, 0.15 mg/L is not below 0.2 mg/L, but 0.14 mg/L is.
- Anytime your Monthly Operating Report (MOR) shows a low disinfectant level, make sure you include comments about why and how long.



In-line chloramine analyzer.
Photo by Serenity Valdez.

Reporting Made Simple

Distribution System Reporting

Systems must report a field residual measurement to the lab **with each total coliform sample**. All labs certified for total coliform analysis report the field residual measurement to the state with each total coliform sample result.

Surface Water (or GWUDI) System Entry Point Reporting

Systems must use the appropriate Monthly Operating Report (MOR) Form for their specific treatment type.

ALL laboratory and system reporting forms can be found at
<https://www.colorado.gov/cdphe/wq-drinking-water-compliance-forms>